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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
SONG, HOON K	
ART UNIT	**PAPER NUMBER**
2882	

DATE MAILED: 12/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/064,160	JENSEN ET AL.
	Examiner	**Art Unit**
	Hoon Song	2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 June 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 9-16, 19, 21-26, 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuo-Pettravic et al. (US 5375156) in view of Kobayashi (US 5095501).

Regarding claim 1, Kuo teaches a medical diagnostic imaging system, comprising:

a C-arm unit having an x-ray source for generating x-rays and a receptor for obtaining image exposures from received x-rays, said C-arm unit moving said x-ray source and receptor along an image acquisition path between at least first and second exposure positions, said C-arm unit rotating about a central axis (figure 2);

an image processor collecting a series of image exposures from said receptor including at least first and second image exposures obtained while said x-ray source and receptor are located at said at least first and second exposure positions, respectively, said image processor collecting position data for multiple exposure positions corresponding to said series of image exposures, said image processor constructing a three dimensional (3D) volumetric data set based on said series of image exposures and said position data for said exposure positions (column 5 line 30+); and

a display displaying images based on said 3D volumetric data set.

However Kuo fails to teach x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving at least one of said x-ray source and receptor in a radial direction toward and away from said central axis of the C-arm unit to maintain a desired distance between a patient and said at least one of said x-ray source and receptor.

Kobayashi teaches the x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving at least one of said x-ray source and receptor in a radial direction toward and away from said central axis of the C-arm unit to maintain a desired distance between a patient and said at least one of said x-ray source and receptor (figure 3A).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide 3D image generating C-arm x-ray system with radially moving brackets as taught by Kobayashi since the device of Kobayashi would provide an better image by constantly maintaining the x-ray source and image detector distance (column 5 line 50+).

Regarding claim 2, Kobayashi teaches a mainframe rotating said x-ray source and receptor to a first scan angle and radially moving said x-ray source and receptor to x-ray source and receptor radial distances, respectively, said x-ray source and receptor radial distances being different from one another and corresponding to distances from said central axis to said x-ray source and receptor, respectively (figure 6C and D, while

the mainframe rotating the SID (x-ray source and image detector distance) is kept constant).

Regarding claim 3, Kobayashi teaches a control panel for setting maximum and minimum radial distances relative to said central axis for at least one of said receptor and x-ray source (column 6 line 32+).

Regarding claim 4, Kobayashi teaches a tracking subsystem receiving coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, said x-ray source and receptor moving in a radial direction relative to said central axis based on said coordinate data while said x-ray source and receptor are located at said at least first and second exposure positions (encoder, column 6 line 25+).

Regarding claim 9, Kuo teaches a method for acquiring multiple x-ray images utilized to reconstruct a three dimensional (3D) volume of patient information, the method comprising:

rotating an x-ray source and receptor about a central axis between at least first and second scan angles, said central axis corresponding to a region of interest in a patient;

acquiring at least first and second images at said at least first and second scan angles; and

constructing a three dimensional (3D) volumetric data set based on said at least first and second images.

However Kuo fails to teach radially moving at least one of the x-ray source and receptor to first radial distances from said central axis when at said first scan angle and radially moving the at least one of the x-ray source and receptor to second radial distances from said central axis when at said second scan angle.

Kobayashi teaches radially moving at least one of the x-ray source and receptor to first radial distances from said central axis when at said first scan angle and radially moving the at least one of the x-ray source and receptor to second radial distances from said central axis when at said second scan angle.

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide 3D image generating C-arm x-ray system with radially moving brackets as taught by Kobayashi since the device of Kobayashi would provide an better image by constantly maintaining the x-ray source and image detector distance (column 5 line 50+).

Regarding claim 10, Kobayashi teaches that the radially moving step further comprising defining a radial distance from said central axis to the receptor based on a radial distance from said central axis to a patient surface (column 5 line 50+).

Regarding claim 11, Kobayashi teaches that the radially moving step further comprising: defining maximum and minimum radial distances relative to said central axis for the at least one of the x-ray source and receptor; and calculating intermediate radial distances corresponding to said at least first and second scan angles for the x-ray source and receptor based on said maximum and minimum radial distances (column 6 line 32+).

Regarding claim 12, Kobayashi teaches that the radially moving step further comprising coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, to define said first and second radial distances (encoder, column 6 line 25+).

Regarding claim 13, Kobayashi teaches that 1 3.The method of claim 9, the radially moving step further comprising: determining said first radial distance for the receptor relative to said central by radially moving the receptor towards a patient surface until receiving a sensor signal indicating a predefined distance between the receptor and the patient surface; and calculating said second radial distance for the x-ray source relative to said central axis based on said first radial distance for the receptor (column 5 line 20+).

Regarding claim 14, Kobayashi teaches that defining maximum and minimum radial distances relative to said central axis for the at least one of the x-ray source and receptor (column 6 line 32+).

Regarding claim 15, Kobayashi teaches that the radially moving step further comprising: radially moving the receptor to said first radial distance relative to said central axis based on at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively; and radially moving the x-ray source to maintain a predetermined distance between the receptor and x-ray source (column 5 line 20+ and line 50+).

Regarding claim 16, Kuo teaches an x-ray apparatus for acquiring x-ray images and reconstructing three dimensional (3D) volumes of patient information, comprising:

a C-arm unit having an x-ray source for generating x-rays and a receptor for obtaining image exposures from received x-rays said C-arm unit moving said x-ray source and receptor along an image acquisition path between a series of exposure positions, said C-arm unit having a central axis corresponding to a region of interest in a patient, said C-arm unit rotating about said central axis (figure 2);

a data processor tracking component coordinate data based on at least one of a distance between said central axis and one of said receptor, said x-ray source, and a patient;

an image processor collecting a series of image exposures from said receptor obtained while said x-ray source and receptor are located at said series of exposure positions, said image processor receiving said component coordinate data from said data processor for said series of exposure positions corresponding to said series of image exposures and constructing a three dimensional (3D) volumetric data set based on said series of image exposures and said component coordinate data for said series of exposure positions; and

a display displaying images based on said (3D) volumetric data set.

However Kuo fails to teach x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving at least one of said x-ray source and receptor in a radial direction

toward and away from said central axis of the C-arm unit to maintain a desired distance between a patient and said at Least one of said x-ray source and receptor.

Kobayashi teaches x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving at least one of said x-ray source and receptor in a radial direction toward and away from said central axis of the C-arm unit to maintain a desired distance between a patient and said at least one of said x-ray source and receptor.

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide 3D image generating C-arm x-ray system with radially moving brackets as taught by Kobayashi since the device of Kobayashi would provide an better image by constantly maintaining the x-ray source and image detector distance (column 5 line 50+).

Regarding claim 19, Kobayashi teaches a control panel for setting maximum and minimum radial distances relative to said central axis for at least one of said receptor and x-ray source (column 6 line 32+).

Regarding claim 21, Kobayashi teaches that said desired distance comprises a uniform distance between said x-ray source and receptor (constant SID).

Regarding claim 22, Kobayashi teaches said desired distance maintains a region of interest of said patient at said central axis (column 5 line 50+).

Regarding claim 23, Kobayashi teaches said desired distance maintains a region of interest of said patient at an isocenter of said imaging system (column 5 line 50+).

Regarding claim 24, Kobayashi teaches a region of interest of said patient is maintained at said central axis for said series of image exposures (column 5 line 50+).

Regarding claim 25, Kuo teaches a medical diagnostic imaging system, comprising:

a C-arm unit having an x-ray source for generating x-rays and a receptor for obtaining image exposures from received x-rays, said C-arm unit moving said x-ray source and receptor along an image acquisition path between at least first and second exposure positions, said C-arm unit rotating about a central axis corresponding to a region of interest in a patient;

an image processor collecting a series of image exposures from said receptor including at least first and second image exposures obtained while said x-ray source and receptor are located at said at least first and second exposure positions, respectively, said image processor collecting position data for multiple exposure positions corresponding to said series of image exposures, said image processor constructing a three dimensional (3D) volumetric data set based on said series of image exposures and said position data for said multiple exposure positions; and

a display displaying images based on said 3D volumetric data set.

However Kuo fails to teach x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving said x-ray source and receptor to maintain said central axis for a series of image exposures.

Kobayashi teaches x-ray source and receptor brackets mounting said x-ray source and receptor, respectively, to said C-arm unit, said x-ray source and receptor brackets moving said x-ray source and receptor to maintain said central axis for a series of image exposures.

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide 3D image generating C-arm x-ray system with radially moving brackets as taught by Kobayashi since the device of Kobayashi would provide an better image by constantly maintaining the x-ray source and image detector distance (column 5 line 50+).

Regarding claim 26, Kobayashi teaches a tracking subsystem receiving coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, said x-ray source and receptor moving relative to said central axis based on said coordinate data while said x-ray source and receptor are located at said at least first and second exposure positions (encoder, column 6 line 24+).

Regarding claim 29, Kuo teaches a method for acquiring multiple x-ray images utilized to reconstruct a three dimensional (3D) volume of patient information, the method comprising:

rotating an x-ray source and receptor about a central axis between at least first and second scan angles, said central axis corresponding to a region of interest in a patient;

acquiring at least first and second images at said at least first and second scan angles; and

constructing a three dimensional (3D) volumetric data set based on said at least first and second images.

However Kuo fails to teach moving the x-ray source and receptor to first distances to maintain said central axis when at said first scan angle and moving the x-ray source and receptor to second distances to maintain said central axis when at said second scan angle.

Kobayashi teaches moving the x-ray source and receptor to first distances to maintain said central axis when at said first scan angle and moving the x-ray source and receptor to second distances to maintain said central axis when at said second scan angle (rotating while marinating source to detector distance constant).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide 3D image generating C-arm x-ray system with radially moving brackets as taught by Kobayashi since the device of Kobayashi would provide an better image by constantly maintaining the x-ray source and image detector distance (column 5 line 50+).

Regarding claim 30, Kobayashi teaches detecting coordinate data comprising at least one of patient, receptor, and instrument coordinate information based on a distance between said central axis and one of a patient, said receptor, and an instrument, respectively, to define said first and second distances (encoder, column 6 line 23+).

Regarding claim 31, Kobayashi teaches determining said first distance for the receptor relative to said central axis by moving the receptor towards a patient surface until receiving a sensor signal indicating a predefined distance between the receptor and the patient surface; and calculating said second distance for the x-ray source relative to said central axis based on said first distance for the receptor (column 5 line 20+).

Claims 5-8, 17-18, 20 and 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuo as modified by Kobayashi as applied to claim 1 above, and further in view of Schmitz et al. (US 6050724).

Kuo as modified by Kobayashi teaches a mainframe receiving x-ray source position data indicative of a distance between a patient surface and said x-ray source from a first sensor attached to said x-ray source bracket and receptor position data indicative of a distance between said receptor and a patient surface (encoder means as taught by Kobayashi).

However Kuo as modified by Kobayashi fails to teach that at least one sensor detecting a radial position of said receptor relative to a patient surface is attached to the x-ray source and detector.

Schmitz teaches the receptor comprising at least one sensor detecting radial position of said receptor relative to a patient surface (8, 9, figure 1).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide the position sensor to the receptor as taught by Kuo as

modified by Kobayashi since the position sensor would provide exact coordination between x-ray image device and the patient (column 2 line 62+).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoon Song whose telephone number is 703-308-2736. The examiner can normally be reached on 8:30 AM - 5 PM, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on 703-308-4858. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

David Bruce

Hoon Song HKS

DAVID V. BRUCE
PRIMARY EXAMINER

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